August 2016 AG/AnimalHealth/2016-01pr

Understanding the Semen Evaluation Portion of the Breeding Soundness Evaluation

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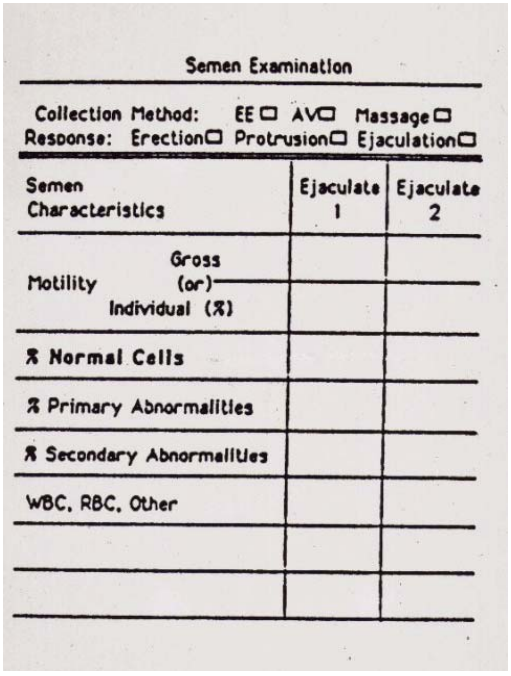
Introduction

The bull breeding soundness evaluation (BSE) is a proven management practice to enhance beef herd reproductive performance. There seems to be confusion among cattle producers regarding what is reported under the semen examination section of BSE forms. The purpose of this fact sheet is to explain what each category is on the form, why it is important, and what the requirements are for a bull to be considered a satisfactory breeder. These requirements or standards have been established by the Society for Theriogenology (SFT), the branch of veterinary medicine that deals with animalreproduction.

SFT Thresholds

The following standards were published by the SFT in 1993[1] following extensive research regarding the minimum thresholds that need to be met for a bull to be classified as a "Satisfactory Potential Breeder." Bulls not meeting these criteria are either classified as "Unsatisfactory Potential Breeder" or "Classification Deferred." While the thresholds include Scrotal Circumference, this paper will only discuss the Semen Examination portion of the BSE.

Category	Threshold	
Sperm Motility	30% Individual motility and/or "Fair" Gross motility	
Sperm Morphology	70% Normal sperm	
Scrotal Circumference	30 cm at	12-15 mo.
	31 cm at	>15-18 mo.
	32 cm at	>18-21 mo.
	33 cm at	>21-24 mo.
	34 cm at	>24 mo.



Semen Examination

Collection Method: EE ☐ AV ☐ Massage ☐
Response: Erection ☐ Protrusion ☐ Ejaculation ☐

Semen Characteristics	Ejaculate 1	Ejaculate 2
Motility Gross (or) Individual (%)		
% Normal Cells		
% Primary Abnormalities		
% Secondary Abnormalities		
WBC, RBC, Other		

Figure 1. Semen Examination part of the Breeding Soundness Evaluation form developed for veterinary use by the Society for Theriogenology.

Sperm Motility

Sperm cells are considered "motile," meaning they are capable of self-propelled movement. During semen examination, sperm may be "progressively," "non-progressively," or "non" motile. Progressively motile sperm move in pretty much a straight line, while non-progressively motile sperm might move, but their movement may be in a circle without making much forward progress. Non-motile sperm do not move and may even be dead.

Motility becomes critical at the time of fertilization since it facilitates the sperm being able to penetrate the surface of the egg.[3]

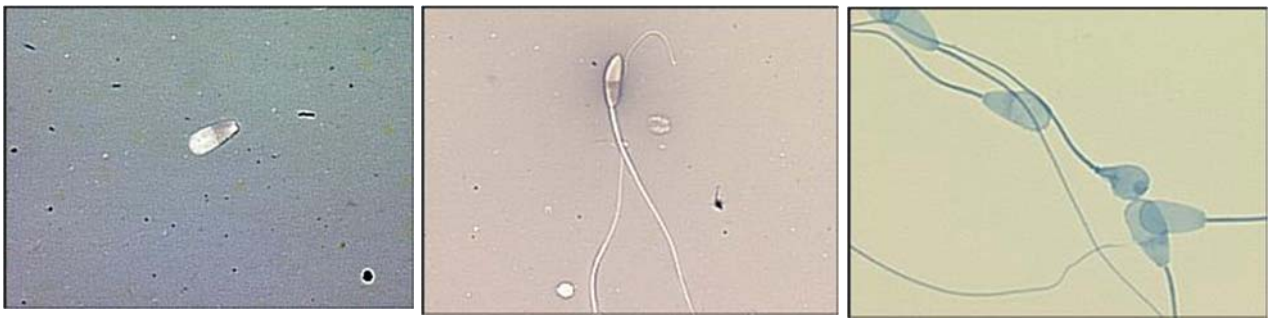
The SFT places the least amount of importance on the motility segment of the semen evaluation. This reduced emphasis is "primarily due to the difficulty of controlling laboratory conditions in the field which are necessary for accuracy and repeatability in motility measurements."[4] In other words, there is too much subjectivity between individuals examining the semen samples to allow it to be precise.

The authors' experience indicates that in the field most veterinarians tend to report "Gross Motility" with a ranking of fair, good, very good or excellent, rather than reporting a percentage of individual cells that are progressively motile. As shown in the table, a "Fair" rating for motility is sufficient for the bull to be classified as a satisfactory potential breeder.

Sperm Morphology

Morphology refers to the actual physical structure of the individual sperm cells. The minimum threshold for a bull to be classified as a satisfactory potential breeder is 70% normal, live cells. Sperm abnormalities are divided into two major categories called primary and secondary abnormalities. Primary abnormalities are caused by a failure during the formation of the cell in the testes. Secondary abnormalities occur as the sperm travel through the epididymis.[5] The presence of either category of abnormalities in quantities greater than 30% will reduce the fertility of the bull resulting in a designation of either "unsatisfactory potential breeder" or "classification deferred," meaning the bull should be retested after 21-60 days to see if the problem has cleared itself up.

Some examples of primary abnormalities are detached heads, excessively large or small heads and misshapen heads (i.e., round, tapered, etc.). See examples below.



Photos 1-3. L to R. Detached head. Elongated head. Round head with four normal sperm cells. Photos courtesy of Colorado State University.

Examples of secondary abnormalities are proximal or distal cytoplasmic droplets, bent tails, coiled tails and bent midpieces. See examples below.

Photos 4-6. L to R. Distal cytoplasmic droplet. Bent tail or midpiece. Coiled midpiece/tail in one sperm and proximal cytoplasmic droplet in another. Photos courtesy of Colorado State University.

Conclusion

It is important to remember that a semen evaluation is just a snapshot of a given sample on the day the sample is taken. Sperm production is a process that begins deep within the testes and takes approximately 60 days for the sperm to mature as they travel through the seminiferous tubules of the epididymis prior to ejaculation. Many things can occur during that maturation process that can have a negative impact on the individual sperm. Bulls failing to be classified as satisfactory potential breeders should be retested at a future date (21-60 days) to determine if the problem has been corrected and the bull can be reclassified as satisfactory.

The SFT thresholds have been established following extensive research regarding male fertility and represent the minimum levels whereby a bull can be considered as a satisfactory potential breeder.

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Photos Credits

1 Rouge, M. 2004. Detached head. http://www.vivo.colostate.edu/hbooks/pathphys/reprod/semeneval/morph.html Accessed April 28, 2016.
2 Rouge, M. 2004. Elongated head. http://www.vivo.colostate.edu/hbooks/pathphys/reprod/semeneval/morph.html Accessed April 28, 2016.
3 Rouge, M. 2004. Misshapen head along with four normal sperm. http://www.vivo.colostate.edu/hbooks/pathphys/reprod/semeneval/morph.html Accessed April 28, 2016.
4 Rouge, M. 2004. Distal droplet. http://www.vivo.colostate.edu/hbooks/pathphys/reprod/semeneval/morph.html Accessed April 28, 2016.
5 Rouge, M. 2004. Bent tail or midpiece. http://www.vivo.colostate.edu/hbooks/pathphys/reprod/semeneval/morph.html Accessed April 28, 2016.
6 Rouge, M. 2004. Coiled midpiece/tail in one sperm and proximal droplet in another. http://www.vivo.colostate.edu/hbooks/pathphys/reprod/semeneval/morph.html Accessed April 28, 2016.